PCT09

RAW SEQUENCE LISTING   DATE: 01/15/2002
PATENT APPLICATION: US/09/914,541   TIME: 13:04:25

Input Set : A:\09914541.app
Output Set: N:\CRF3\01152002\I914541.raw

ENTERED

```
 3 <110> APPLICANT: THE UNIVERSITY OF TENNESSEE RESEARCH CORPORATION
 4       BECKER, JEFFREY M.
 5       HAUSER, MELINDA
 6       DONHARDT, AMY
 7       BARNES, DAVID
 9 <120> TITLE OF INVENTION: EUKARYOTIC PEPTIDE UPTAKE SYSTEM FOR TRANSPORTING
10       ENKEPHALINS
12 <130> FILE REFERENCE: 1046-PCT-00
14 <140> CURRENT APPLICATION NUMBER: 09/914541
15 <141> CURRENT FILING DATE: 2001-08-29
17 <150> PRIOR APPLICATION NUMBER: PCT/US00/05158
18 <151> PRIOR FILING DATE: 2000-03-01
20 <150> PRIOR APPLICATION NUMBER: 60/122,312
21 <151> PRIOR FILING DATE: 1999-03-01
23 <160> NUMBER OF SEQ ID NOS: 26
25 <170> SOFTWARE: PatentIn Ver. 2.1
27 <210> SEQ ID NO: 1
28 <211> LENGTH: 2400
29 <212> TYPE: DNA
30 <213> ORGANISM: Saccharomyces cerevisiae
32 <400> SEQUENCE: 1
33 atgagtacca tttataggga gagcgactcg ttggagtcgg agccctcgcc aacgccaaca 60
34 accattccta tccagatcaa tatggaagag gaaaagaaag atgctttcgt taagaatatt 120
35 gacgaggacg tcaataatct cactgcgact actgatgagg aggaccgcga tccggaaagc 180
36 caaaaattcg acaggcattc catacaggag gaaggtctcg tttggaaggg cgaccctaca 240
37 tacttgccca attctccata tcctgaagtg agatcggcgg tgtccatcga ggatgacccc 300
38 accatccgcc tcaaccactg gagaacgtgg ttcttgacca cggtgtttgt ggtagttttc 360
39 gccggtgtta atcaattttt ttccctgaga tatccatcgc tagagatcaa cttccttgtt 420
40 gcacaagttg tttgctaccc aattggtagg atactggctc tcttgcccga ctggaagtgt 480
41 tctaaagtgc cattttttcga tttaaacccg ggcccattta ccaaaaagga cacgccgtg 540
42 gtcacaattg ccgtggcgct tacttcctct actgcatacg ctatgtacat tttgaacgcc 600
43 cagggaagct tttacaacat gaaacttaat gtcggatatc agttcttgtt ggtttggaca 660
44 tctcaaatga ttggttatgg tgctgcaggt cttaccagaa gatgggtcgt caaccctgca 720
45 agctctatct ggcctcagac tttaatttca gtgtccttgt ttgattcgtt gcactcgaga 780
46 aaagttgaaa agacagtcgc aaatggttgg acgatgcccc gttacaggtt cttcttaatc 840
47 gtccttatcg gatcgttcat ctggtattgg gtacctggat tcctctttac cggtctgtcc 900
48 tatttcaacg ttatcctatg ggggtcgaag acaagacaca atttcatcgc taacacaatc 960
49 tttggtactc aaagtggtct cggtgcgttg ccaattacat tgactacac ccaggtttcc 1020
50 caagccatgt ccggctctgt tttcgccaca ccattctacg tctccgccaa cacctatgca 1080
51 tcagtgttga tattcttcgt catagtgctg ccatgtcttt attttacgaa tacctggtat 1140
52 gccaaataca tgcccgtcat ttcaggttct acttatgaca cactcaaaa caaatacaac 1200
53 gtaacaaaga ttcttaacga ggattattcc attaatcttg agaaatataa ggaatactca 1260
54 ccggtattcg ttccattttc ctatcttttg tcgtatgctt taaattttgc cgctgttatc 1320
55 gccgttttttg tccactgcat cttataccac ggtaaagata ttgtcgccaa gtttaaagac 1380
56 cgtaaaaatg gtggcactga cattcacatg agaatctact ccaagaacta taggattgt 1440
57 cccgattggt ggtatttact tttgcagatt gtcatgatcg gtttaggatt tgtagcagtg 1500
58 tgctgtttcg atactaagtt cccagcttgg gcatttgtta ttgcaatatt aatttccctt 1560
```

RAW SEQUENCE LISTING   DATE: 01/15/2002
PATENT APPLICATION: US/09/914,541   TIME: 13:04:25

Input Set : A:\09914541.app
Output Set: N:\CRF3\01152002\I914541.raw

```
59 gtaaatttca tcccgcaagg tatcttggaa gcaatgacta accaacacgt aggtttgaat 1620
60 attatcacag aattgatctg cggttatatg ctgcctttaa gaccaatggc aaacttatta 1680
61 ttcaagctat acggatttat tgtcatgaga caaggcttga atttgagtag agatttgaaa 1740
62 ttagccatgt acatgaaggt ttcccctcgt ttgatctttg ccgttcaaat ctatgccact 1800
63 atcatatcag gcatggttaa cgttggtgtc caggaatgga tgatgcataa tatcgatggc 1860
64 ttatgtacca ccgatcaacc aaatggcttc acttgtgcta atggtcgcac ggttttcaat 1920
65 gcttccatta tctggtcttt gccaaagtat cttttctcat cagggcgcat ttataatccg 1980
66 ctgatgtggt tcttcttgat tggtttgcta ttcccactag ccgtttatgc tgttcaatgg 2040
67 aaattcccta aatttaaatt tgctaagcac attcatactc ctgtattttt cacaggccca 2100
68 ggtaatattc caccaagcac accttataac tactcattat tttttgcaat gtcattctgc 2160
69 ctaaacttga taagaaaaag atggagagct tggttcaata agtacaattt cgtcatgggg 2220
70 gccggtgttg aagcaggtgt ggcaatctcc gtcgtcatca tcttcttgtg tgtacagtac 2280
71 ccaggtggta agctcagctg gtggggaaac aacgtttgga aagaacgta tgataatgat 2340
72 tataaaaaat tttatacctt aaagaaaggt gagacatttg gttatgataa atggtggtaa 2400
75 <210> SEQ ID NO: 2
76 <211> LENGTH: 799
77 <212> TYPE: PRT
78 <213> ORGANISM: Saccharomyces cerevisiae
80 <400> SEQUENCE: 2
81 Met Ser Thr Ile Tyr Arg Glu Ser Asp Ser Leu Glu Ser Glu Pro Ser
82   1               5                  10                  15
84 Pro Thr Pro Thr Thr Ile Pro Ile Gln Ile Asn Met Glu Glu Glu Lys
85              20                  25                  30
87 Lys Asp Ala Phe Val Lys Asn Ile Asp Glu Asp Val Asn Asn Leu Thr
88          35                  40                  45
90 Ala Thr Thr Asp Glu Glu Asp Arg Asp Pro Glu Ser Gln Lys Phe Asp
91      50                  55                  60
93 Arg His Ser Ile Gln Glu Glu Gly Leu Val Trp Lys Gly Asp Pro Thr
94 65                  70                  75                  80
96 Tyr Leu Pro Asn Ser Pro Tyr Pro Glu Val Arg Ser Ala Val Ser Ile
97                  85                  90                  95
99 Glu Asp Asp Pro Thr Ile Arg Leu Asn His Trp Arg Thr Trp Phe Leu
100              100                 105                 110
102 Thr Thr Val Phe Val Val Val Phe Ala Gly Val Asn Gln Phe Phe Ser
103          115                 120                 125
105 Leu Arg Tyr Pro Ser Leu Glu Ile Asn Phe Leu Val Ala Gln Val Val
106      130                 135                 140
108 Cys Tyr Pro Ile Gly Arg Ile Leu Ala Leu Leu Pro Asp Trp Lys Cys
109 145                 150                 155                 160
111 Ser Lys Val Pro Phe Phe Asp Leu Asn Pro Gly Pro Phe Thr Lys Lys
112                  165                 170                 175
114 Glu His Ala Val Val Thr Ile Ala Val Ala Leu Thr Ser Ser Thr Ala
115              180                 185                 190
117 Tyr Ala Met Tyr Ile Leu Asn Ala Gln Gly Ser Phe Tyr Asn Met Lys
118          195                 200                 205
120 Leu Asn Val Gly Tyr Gln Phe Leu Leu Val Trp Thr Ser Gln Met Ile
121      210                 215                 220
123 Gly Tyr Gly Ala Ala Gly Leu Thr Arg Arg Trp Val Val Asn Pro Ala
124 225                 230                 235                 240
```

RAW SEQUENCE LISTING   DATE: 01/15/2002
PATENT APPLICATION: US/09/914,541   TIME: 13:04:25

Input Set : A:\09914541.app
Output Set: N:\CRF3\01152002\I914541.raw

```
126 Ser Ser Ile Trp Pro Gln Thr Leu Ile Ser Val Ser Leu Phe Asp Ser
127             245             250             255
129 Leu His Ser Arg Lys Val Glu Lys Thr Val Ala Asn Gly Trp Thr Met
130             260             265             270
132 Pro Arg Tyr Arg Phe Phe Leu Ile Val Leu Ile Gly Ser Phe Ile Trp
133             275             280             285
135 Tyr Trp Val Pro Gly Phe Leu Phe Thr Gly Leu Ser Tyr Phe Asn Val
136     290             295             300
138 Ile Leu Trp Gly Ser Lys Thr Arg His Asn Phe Ile Ala Asn Thr Ile
139 305             310             315             320
141 Phe Gly Thr Gln Ser Gly Leu Gly Ala Leu Pro Ile Thr Phe Asp Tyr
142             325             330             335
144 Thr Gln Val Ser Gln Ala Met Ser Gly Ser Val Phe Ala Thr Pro Phe
145             340             345             350
147 Tyr Val Ser Ala Asn Thr Tyr Ala Ser Val Leu Ile Phe Phe Val Ile
148         355             360             365
150 Val Leu Pro Cys Leu Tyr Phe Thr Asn Thr Trp Tyr Ala Lys Tyr Met
151     370             375             380
153 Pro Val Ile Ser Gly Ser Thr Tyr Asp Asn Thr Gln Asn Lys Tyr Asn
154 385             390             395             400
156 Val Thr Lys Ile Leu Asn Glu Asp Tyr Ser Ile Asn Leu Glu Lys Tyr
157             405             410             415
159 Lys Glu Tyr Ser Pro Val Phe Val Pro Phe Ser Tyr Leu Leu Ser Tyr
160             420             425             430
162 Ala Leu Asn Phe Ala Ala Val Ile Ala Val Phe Val His Cys Ile Leu
163         435             440             445
165 Tyr His Gly Lys Asp Ile Val Ala Lys Phe Lys Asp Arg Lys Asn Gly
166     450             455             460
168 Gly Thr Asp Ile His Met Arg Ile Tyr Ser Lys Asn Tyr Lys Asp Cys
169 465             470             475             480
171 Pro Asp Trp Trp Tyr Leu Leu Leu Gln Ile Val Met Ile Gly Leu Gly
172             485             490             495
174 Phe Val Ala Val Cys Cys Phe Asp Thr Lys Phe Pro Ala Trp Ala Phe
175         500             505             510
177 Val Ile Ala Ile Leu Ile Ser Leu Val Asn Phe Ile Pro Gln Gly Ile
178     515             520             525
180 Leu Glu Ala Met Thr Asn Gln His Val Gly Leu Asn Ile Ile Thr Glu
181     530             535             540
183 Leu Ile Cys Gly Tyr Met Leu Pro Leu Arg Pro Met Ala Asn Leu Leu
184 545             550             555             560
186 Phe Lys Leu Tyr Gly Phe Ile Val Met Arg Gln Gly Leu Asn Leu Ser
187             565             570             575
189 Arg Asp Leu Lys Leu Ala Met Tyr Met Lys Val Ser Pro Arg Leu Ile
190             580             585             590
192 Phe Ala Val Gln Ile Tyr Ala Thr Ile Ile Ser Gly Met Val Asn Val
193         595             600             605
195 Gly Val Gln Glu Trp Met Met His Asn Ile Asp Gly Leu Cys Thr Thr
196     610             615             620
198 Asp Gln Pro Asn Gly Phe Thr Cys Ala Asn Gly Arg Thr Val Phe Asn
```

Input Set : A:\09914541.app
Output Set: N:\CRF3\01152002\I914541.raw

```
199 625                   630                635                640
201 Ala Ser Ile Ile Trp Ser Leu Pro Lys Tyr Leu Phe Ser Ser Gly Arg
202             645              650             655
204 Ile Tyr Asn Pro Leu Met Trp Phe Phe Leu Ile Gly Leu Leu Phe Pro
205             660              665             670
207 Leu Ala Val Tyr Ala Val Gln Trp Lys Phe Pro Lys Phe Lys Phe Ala
208         675              680             685
210 Lys His Ile His Thr Pro Val Phe Phe Thr Gly Pro Gly Asn Ile Pro
211     690              695             700
213 Pro Ser Thr Pro Tyr Asn Tyr Ser Leu Phe Phe Ala Met Ser Phe Cys
214 705              710             715             720
216 Leu Asn Leu Ile Arg Lys Arg Trp Arg Ala Trp Phe Asn Lys Tyr Asn
217             725              730             735
219 Phe Val Met Gly Ala Gly Val Glu Ala Gly Val Ala Ile Ser Val Val
220         740              745             750
222 Ile Ile Phe Leu Cys Val Gln Tyr Pro Gly Gly Lys Leu Ser Trp Trp
223         755              760             765
225 Gly Asn Asn Val Trp Lys Arg Thr Tyr Asp Asn Asp Tyr Lys Lys Phe
226     770              775             780
228 Tyr Thr Leu Lys Lys Gly Glu Thr Phe Gly Tyr Asp Lys Trp Trp
229 785              790             795
232 <210> SEQ ID NO: 3
233 <211> LENGTH: 753
234 <212> TYPE: PRT
235 <213> ORGANISM: Arabidopsis thaliana
237 <400> SEQUENCE: 3
238 Met Val Gly Ser Leu Glu Val Ser Lys Pro Pro Glu His Lys Val Glu
239   1               5              10              15
241 Ser Lys Ile Val Ile Ala Asp Glu Glu Glu Asp Glu Asn Asp Ser
242         20              25              30
244 Pro Ile Glu Glu Val Arg Leu Thr Val Pro Ile Thr Asp Asp Pro Ser
245         35              40              45
247 Leu Pro Val Leu Thr Phe Arg Thr Trp Phe Leu Gly Met Val Ser Cys
248     50              55              60
250 Val Val Leu Ala Phe Val Asn Asn Phe Phe Gly Tyr Arg Ser Asn Pro
251 65              70              75              80
253 Leu Thr Val Ser Ser Val Val Ala Gln Ile Ile Thr Leu Pro Leu Gly
254             85              90              95
256 Lys Leu Met Ala Thr Thr Leu Pro Thr Thr Lys Leu Arg Leu Pro Gly
257         100             105             110
259 Thr Asn Trp Ser Cys Ser Leu Asn Pro Gly Pro Phe Asn Met Lys Glu
260         115             120             125
262 His Val Leu Ile Thr Ile Phe Ala Asn Thr Gly Ala Gly Gly Ala Tyr
263     130             135             140
265 Ala Thr Ser Ile Leu Thr Ile Val Lys Ala Phe Tyr His Arg Asn Leu
266 145             150             155             160
268 Asn Pro Ala Ala Ala Met Leu Leu Val Gln Thr Thr Gln Leu Leu Gly
269             165             170             175
271 Tyr Gly Trp Ala Gly Met Phe Arg Lys Tyr Leu Val Asp Ser Pro Tyr
```

RAW SEQUENCE LISTING   DATE: 01/15/2002
PATENT APPLICATION: US/09/914,541   TIME: 13:04:25

Input Set : A:\09914541.app
Output Set: N:\CRF3\01152002\I914541.raw

```
272             180                 185                 190
274 Met Trp Trp Pro Ala Asn Leu Val Gln Val Ser Leu Phe Arg Ala Leu
275             195                 200                 205
277 His Glu Lys Glu Glu Lys Arg Glu Gly Lys Gln Thr Lys Leu Arg Phe
278         210                 215                 220
280 Phe Leu Ile Val Phe Phe Leu Ser Phe Thr Tyr Tyr Ile Val Pro Gly
281 225                 230                 235                 240
283 Tyr Leu Phe Pro Ser Ile Ser Tyr Leu Ser Phe Val Cys Trp Ile Trp
284             245                 250                 255
286 Thr Arg Ser Val Thr Ala Gln Gln Ile Gly Ser Gly Leu His Gly Leu
287         260                 265                 270
289 Gly Ile Gly Ser Phe Gly Leu Asp Trp Ser Thr Val Ala Gly Phe Leu
290         275                 280                 285
292 Gly Ser Pro Leu Ala Val Pro Phe Phe Ala Ile Ala Asn Ser Phe Gly
293     290                 295                 300
295 Gly Phe Ile Ile Phe Phe Tyr Ile Ile Leu Pro Ile Phe Tyr Trp Ser
296 305                 310                 315                 320
298 Asn Ala Tyr Glu Ala Lys Lys Phe Pro Phe Tyr Thr Ser His Pro Phe
299             325                 330                 335
301 Asp His Thr Gly Gln Arg Tyr Asn Thr Thr Arg Ile Leu Asn Gln Lys
302         340                 345                 350
304 Thr Phe Asn Ile Asp Leu Pro Ala Tyr Glu Ser Tyr Ser Lys Leu Tyr
305         355                 360                 365
307 Leu Ser Ile Leu Phe Ala Leu Ile Tyr Gly Leu Ser Phe Gly Thr Leu
308     370                 375                 380
310 Thr Ala Thr Ile Ser His Val Ala Leu Phe Asp Gly Lys Phe Ile Trp
311 385                 390                 395                 400
313 Glu Leu Trp Lys Lys Ala Thr Leu Thr Thr Lys Asp Lys Phe Gly Asp
314             405                 410                 415
316 Val His Thr Arg Leu Met Lys Lys Asn Tyr Lys Glu Val Pro Gln Trp
317         420                 425         -       430
319 Trp Phe Val Ala Val Leu Ala Ala Ser Phe Val Leu Ala Leu Tyr Ala
320         435                 440                 445
322 Cys Glu Gly Phe Gly Lys Gln Leu Gln Leu Pro Trp Trp Gly Leu Leu
323     450                 455                 460
325 Leu Ala Cys Ala Ile Ala Phe Thr Phe Thr Leu Pro Ile Gly Val Ile
326 465                 470                 475                 480
328 Leu Ala Thr Thr Asn Gln Arg Met Gly Leu Asn Val Ile Ser Glu Leu
329             485                 490                 495
331 Ile Ile Gly Phe Leu Tyr Pro Gly Lys Pro Leu Ala Asn Val Ala Phe
332         500                 505                 510
334 Lys Thr Tyr Gly Ser Val Ser Ile Ala Gln Ala Leu Tyr Phe Val Gly
335         515                 520                 525
337 Asp Phe Lys Leu Gly His Tyr Met Lys Ile Pro Pro Arg Ser Met Phe
338     530                 535                 540
340 Ile Val Gln Leu Val Ala Thr Ile Val Ala Ser Thr Val Ser Phe Gly
341 545                 550                 555                 560
343 Thr Thr Trp Trp Leu Leu Ser Ser Val Glu Asn Ile Cys Asn Thr Asp
344             565                 570                 575
```

Use of n and/or Xaa has been detected in the Sequence Listing.
Review the Sequence Listing to insure a corresponding
explanation is presented in the <220> to <223> fields of
each sequence using n or Xaa.

VERIFICATION SUMMARY   DATE: 01/15/2002
PATENT APPLICATION: **US/09/914,541**   TIME: 13:04:26

Input Set : **A:\09914541.app**
Output Set: **N:\CRF3\01152002\I914541.raw**

```
L:2570 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:24
L:2599 M:258 W: Mandatory Feature missing, <221> not found for SEQ ID#:26
L:2599 M:258 W: Mandatory Feature missing, <222> not found for SEQ ID#:26
L:2599 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:26
```